

(Claims:)

1. An aluminum nitride joined body comprising two pieces of aluminum nitride sintered body plates joined together without using adhesive, and a metal layer formed on a portion of the junction interface thereof, wherein, as viewed on a side section passing through the center of the joined body, a plurality of voids are existing in the directly joined region where the sintered body plates are directly facing each other on the junction interface, the voids having an average length L of 0.5 to 4 μm along the junction interface, thereby forming non-joined portions due to the voids, and a non-joined ratio Q on the side section as calculated by the following formula (1),

$$\text{Non-joined ratio } Q = (X/Y) \times 100 \quad \text{--- (1)}$$

where X is a length of the non-joined portion in the direction of junction interface expressed by the sum of lengths L of the voids existing in the directly joined region, and Y is a length of the directly joined region where the voids are existing,

is in a range of from 0.1 to 0.5% on average.

2. An aluminum nitride joined body as set forth in claim 1, wherein voids having lengths L of not smaller than 5 μm are not substantially existing in said directly coupled region.

3. An aluminum nitride joined body as set forth in claim 1 or 2, wherein a ratio (L/Lp) of the length L of said voids in the direction of junction interface to the length Lp thereof in a direction perpendicular to the junction interface is 0.8 to 2 on average.

4. An aluminum nitride joined body as set forth in any one of claims 1 to 3, wherein the warping in said metal layer is not larger than 25 $\mu\text{m}/10 \text{ mm}$.

5. An aluminum nitride joined body as set forth in any one of claims 1 to 4, wherein the thickness is 1 to 100 mm.

5 6. An aluminum nitride joined body as set forth in any one of claims 1 to 5, wherein after the thermal hysteresis of elevating and lowering the temperature between 25°C and 350°C is repeated 100 times, the shearing strength of the junction surface between the metal layer and the aluminum nitride sintered body
10 plate is not smaller than 90% of the shearing strength of before the thermal hysteresis.

7. A method of producing an aluminum nitride joined body comprising the steps of:

15 preparing two aluminum nitride sintered body plates;

forming a metal layer of a thickness of not larger than 20 μm on a portion of the surface of the one aluminum nitride sintered body plate;

20 forming a laminate by overlapping the other aluminum nitride sintered body plate on the one aluminum nitride sintered body plate in a manner that said metal layer is sandwiched therebetween;

25 heating said laminate at a temperature of 1650 to 1700°C under a pressure of 5 to 100 kg/cm^2 for 0.5 to 4 hours; and

heating said laminate at a temperature of higher than 1700°C but not higher than 1800°C while continuing the compression with said pressure for 2 to 8 hours.

30 8. A method of producing an aluminum nitride joined body as set forth in claim 6, wherein the aluminum nitride sintered body plate has an average surface roughness Ra (JIS B 0601) in a range of 0.1 to 0.8 μm .